

# TECHNICAL SERVICE INFORMATION for



**OLDSCHOOL-SOUND**  
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## CAUTION

These servicing instructions are for use by qualified personnel only. To avoid risk of electric shock, do not perform any servicing other than that described in the Owner's Manual unless you are qualified to do so. Refer all servicing to qualified service personnel.

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## SPECIFICATIONS

### KEYBOARD

- Description: 37 Note C to C, Low note priority
- Keyboard Transpose: +1 Octave (Left hand control)
- Glide Time: Linear, continuously variable from less than 2 msec to 5 sec (bottom to top of keyboard)

### MODULATION

- Rate: Continuously variable from 0.25Hz to 325Hz
- Amount (Square wave): Oscillator, zero to 16 semitones
- Filter, zero to 5 octaves

### OSC 1 AND OSC 2

- Reference frequency: Low C 32, 32.7Hz +/- 0.1Hz
- Scale factor accuracy: 0.21% from 65Hz to 1.5kHz
- Range drift due to temp: 0°C to 40°C less than 0.02%/°C
- Pulse duty cycle: Continuously variable from 5% to 95%
- Octave accuracy: 0.2%
- Output level range: 80dB
- Interval range: 2.1 Octaves
- Interval range: +/- 3%

### VCF

- Type: Low pass 24dB/octave cutoff slope with variable highest resonant peak at cutoff frequency.
- Range of cutoff: 30Hz to 25kHz
- Keyboard tracking accuracy: Full mode, .05% (30Hz to 20kHz)
- Sweep of cutoff frequency by contour generator: 10 octaves

### CONTOUR GENERATORS

- Type: Microprocessor controlled ADSR, intelligible
- Range of attack, decay, release time: 1 msec to 10 sec.
- Range of sustain level: 0 to 100% of peak contour

### VCA

- Audio output level: 0dBm
- Dynamic range: 80dB
- Output offset: Less than 100mV

### REAR PANEL I/O

- Fine tune: +/- 3 semitones
- KB CV IN/OUT: 1 V/octave +/- 2%
- Input impedance = 50K ohm
- Output impedance = 1K ohm
- 3-Trigger in: Switch closure to ground triggers contour generator II, input impedance greater than 1K ohm
- 5-Trigger out: Trigger on 1 switch closure to ground
- Cassette I/O: Tape interface with transport on/off control
- Audio Output: 0dBm, Output impedance = 600 ohms

### POWER REQUIREMENTS

- Operating voltage range
- Domestic: 95 to 130 VAC 60Hz
- Export: 200 to 260 VAC 50Hz
- Power consumption: Less than 30 watts

### DIMENSIONS AND WEIGHT

- Overall size: 26-3/8" wide, 12-1/2" deep, 3" high (67cm x 31.75cm x 7.62cm)
- Net weight: 22 lbs. (8.51kg)

## WARNING

Hazardous voltages are present in power supply circuit. Disconnect AC supply cord prior to disassembly. Exercise care when making tuning adjustments with unit operating to avoid contact with exposed wiring near primary switch and fuse holder.

## CAUTION

Digital Memory Circuits are powered by a 3V lithium battery, BT-1. DO NOT short circuit, overload or attempt to charge this cell. Explosion and release of corrosive chemicals may result.

## DISASSEMBLY PROCEDURE

## NOTE

Before proceeding with disassembly, take care to protect finished wood and lacquered metal parts from sharp objects. Use carpeted or similarly protected surface.

To gain access to tuning adjustments, bottom assembly including keyboard must be separated from upper housing. Start by removing (2) screws from lower rear panel located on either side of Moog logo.

Place unit upside down and remove (4) screws holding bottom to wood ends. Remove rear keyboard mounting screws near center of bottom and loosen (3) front keyboard machine screws until they are finger tight.

Place unit on its feet, lift rear edge approximately one inch and tilt forward to release housing from front groove.

Slide housing forward to clear keys. Lift and rotate front of housing up and rest on rear panel. Take care not to stress flexible "tails" on membrane switch which connect this panel to a P.C. Board at rear of unit.

Carefully tilt board mounting. Lower base, turn left side. Use a screwdriver to lift up housing to gain access to screws. Incrementally turn screws located near front of unit to remove knob from front of unit.

Power Supply is located at front of unit. Remove plate at rear, which covers power supply housing. Power supply is removed without tools.

Digital and Analog sections are held together by plastic clips. Use a screwdriver to remove clips to avoid breakage. Clips are required.

## PCB

PCB ID	Component
111	Header, 1 Pin
112	Header, 1 Pin
113	Header, 1 Pin
114	Header, 1 Pin
115	Header, 1 Pin
116	Header, 1 Pin
U1	IC, Voltage
U2	IC, Operational
U3	IC, Voltage
U4	IC, Voltage
Q1	1 Transistor, NPN
Q2	1 Transistor, NPN
Q3	Transistor, NPN
Q4	Transistor, NPN
CR1	Diode, Rectifier
CR2	Diode, Rectifier
CR3	Diode, Rectifier
CR4	Diode, Rectifier
CR5	Diode, Zener
CR6	Diode, Rectifier
CR7	Diode, Rectifier
CR8	Diode, Rectifier
CR9	Diode, Rectifier
CR10	Diode, Rectifier
CR11	Diode, Rectifier
CR12	Diode, Rectifier
CR13	Diode, Rectifier
C1	Capacitor, 100pF
C2	Capacitor, 100pF
C3	Capacitor, 100pF
C4	Capacitor, 100pF
C5	Capacitor, 100pF
C6	Capacitor, 100pF
C7	Capacitor, 100pF
C8	Capacitor, 100pF
C9	Capacitor, 100pF
C10	Capacitor, 100pF
C11	Capacitor, 100pF
C12	Capacitor, 100pF
C13	Capacitor, 100pF
R1	Resistor, 10k
R14	Resistor, 10k

Carefully rotate base up to gain access to key-board mounting screws and remove (3) front screws. Lower base, remove keyboard assembly and set to left side. Use a screwdriver or similar tool to pop up housing to gain access to trim adjustments.

Incremental control assembly is retained by (2) screws located under knob. Loosen set screw and remove knob for access.

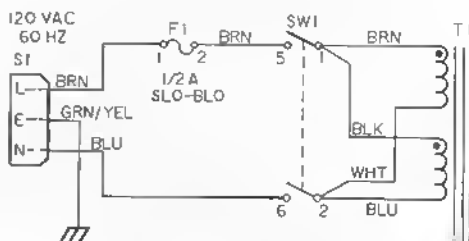
Power Supply P.C. board is retained by (2) screws at front and an aluminum heat sink coupler plate at rear, which in turn is bolted to rear of housing. Power transistors are socketed and can be removed without removal of P.C. board.

Digital and Synh Board assemblies are retained by plastic clips. Care should be taken when bending clips to avoid breakage should board removal be required.

# NOTES:

1. UNLESS OTHERWISE SPECIFIED -  
ALL RESISTORS ARE IN OHMS,  $1/4W, \pm 5\%$ .  
ALL CAPACITORS ARE IN MFD ( $\mu F$ ).  
ALL DIODES ARE IN4004.

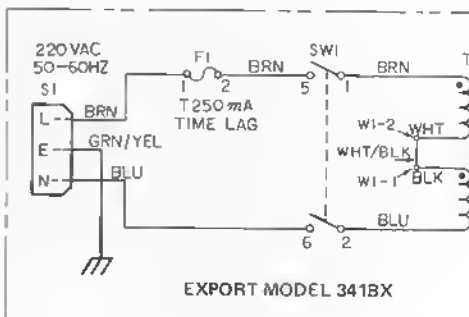
\* 2.F2,F3 & F4 USED ON EXPORT 220VAC ONLY,



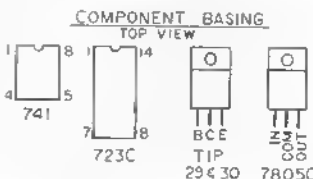
DOMESTIC MODEL 341A

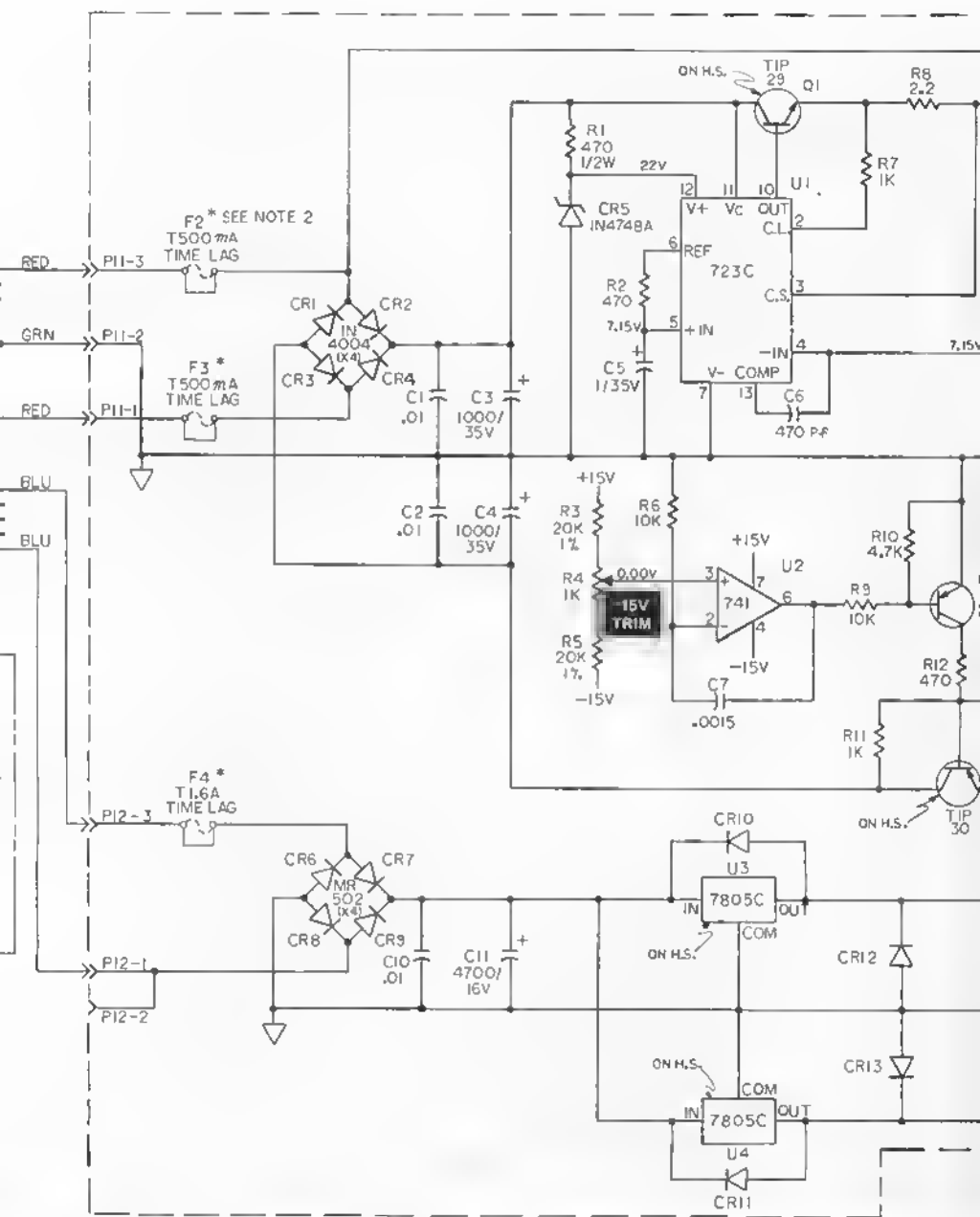
POWER SUPPLY PRINTED CIRCUIT BOARD 1

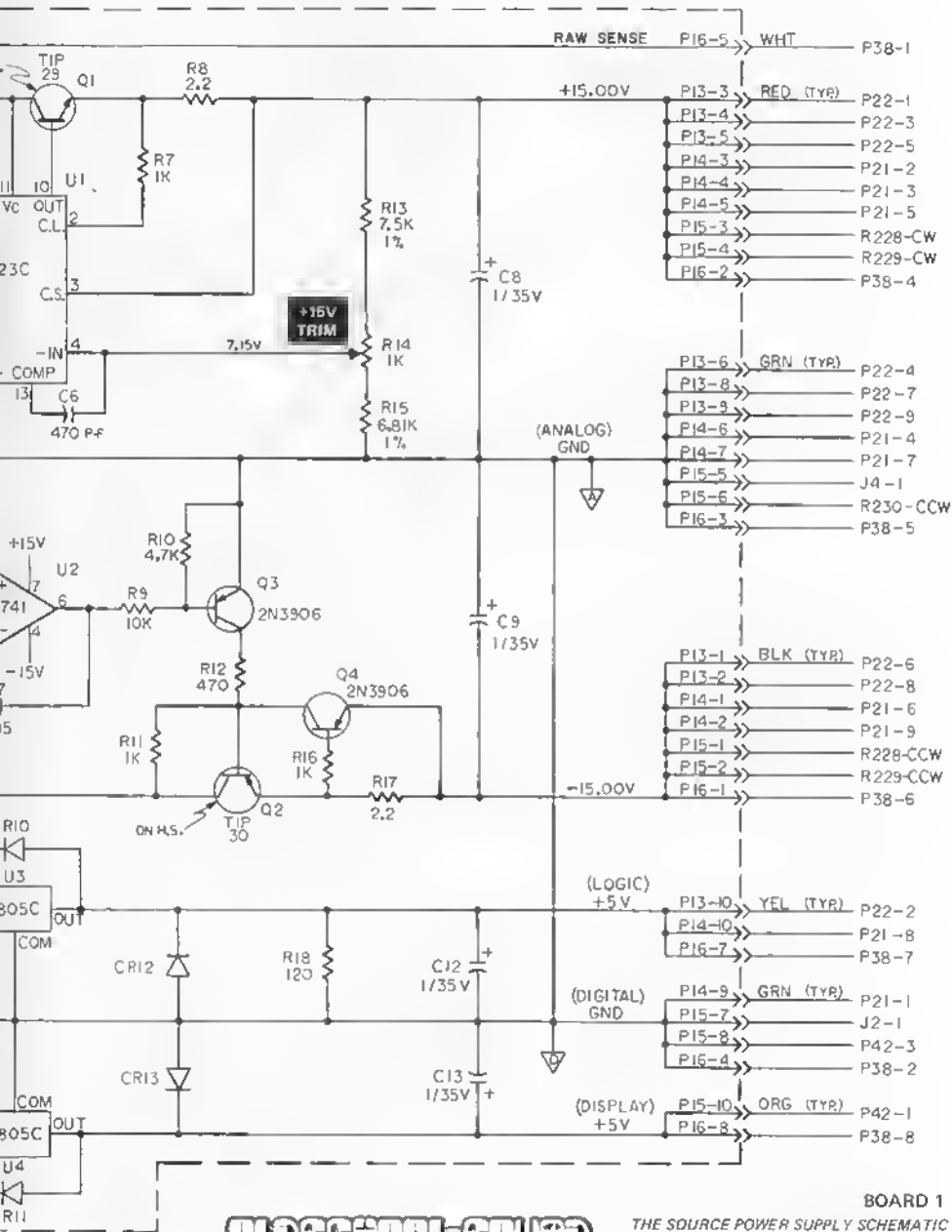
REF. DESIGN	DESCRIPTION	PART NO.
P11	Header, 3 Pin., 156 Ohm Loading	9110-042531-003
P12	Header, 3 Pin., 156 Ohm Loading	9110-042531-003
P13	Header, 10 Pin., 100 Ohm	9110-042299-010
P14	Header, 10 Pin., 100 Ohm	9110-042299-010
P15	Header, 10 Pin., 100 Ohm	9110-042299-010
P16	Header, 3 Pin., 100 Ohm	9110-042299-008
U1	IC, Voltage Reg., 223C	931-041684-001
U2	IC, Operational Amplifier, 141	931-041113-002
U3	IC, Voltage Reg., +5V, 1A, 7805C	931-045308-001
U4	IC, Voltage Reg., +5V, 1A, 7805C	931-045308-001
O1	Transistor, NPN Power, Tip 30	931-041049-001
O2	Transistor, PNP Power, Tip 30	931-041050-001
O3	Transistor, PNP, 2N3905	931-041052-002
O4	Transistor, PNP, 2N3906	931-041052-002
CR1	Diode, Rectifier, 1N4004	9110-042019-001
CR2	Diode, Rectifier, 1N4004	9110-042019-001
CR3	Diode, Rectifier, 1N4004	9110-042019-001
CR4	Diode, Rectifier, 1N4004	9110-042019-001
CR5	Diode, Zener, 1N4748A	9110-041256-002
CR6	Diode, Rectifier, MRS502	9110-041151-001
CR7	Diode, Rectifier, MRS502	9110-041151-001
CR8	Diode, Rectifier, MRS502	9110-041151-001
CR9	Diode, Rectifier, MRS502	9110-041151-001
CR10	Diode, Rectifier, 1N4004	9110-042019-001
CR11	Diode, Rectifier, 1N4004	9110-042019-001
CR12	Diode, Rectifier, 1N4004	9110-042019-001
CR13	Diode, Rectifier, 1N4004	9110-042019-001
C1	Capacitor, Tubular, .01 uf	941-045011-103
C2	Capacitor, Tubular, .01 uf	947-045011-103
C3	Capacitor, Electrolytic, 1000 uf/25V	945-040203-011
C4	Capacitor, Electrolytic, 1000 uf/25V	945-040203-011
C5	Capacitor, Tantalum, 1 uf/35V	946-040231-008
C6	Capacitor, Tubular, 470 pf	947-045008-411
C7	Capacitor, Polyester, .0015 uf	946-041578-152
C8	Capacitor, Tantalum, 1 uf/35V	946-040231-008
C9	Capacitor, Tantalum, 1 uf/35V	946-040231-008
C10	Capacitor, Tubular, .01 uf	941-045011-103
C11	Capacitor, Electrolytic, 4700 uf/16V	945-040208-037
C12	Capacitor, Tantalum, 1 uf/35V	946-040231-008
C13	Capacitor, Tantalum, 1 uf/35V	946-040231-008
R1	Resistor, Trim, Cermet, 1K	925-042388-035
R4	Resistor, Trim, Cermet, 1K	925-042388-035



EXPORT MODEL 341BX







BOARD 1

## ALIGNMENT PROCEDURE

In normal service, The Source does not require tuning. However, when components are replaced, the alignment procedure outlined below should be followed in the sequence indicated in order to provide proper adjustment. Component designators refer to P.C. Board Schematics. Access to some trim adjustments require removal of the keyboard. Allow the instrument to warm up for approximately 30 minutes prior to starting alignment procedure.

## POWER SUPPLY ADJUSTMENTS

### POWER SUPPLY, BOARD 1

Set +15V supply by adjusting +15V trim R14 for +15.000V +/- 10mV. Set -15V supply by adjusting -15V trim R4 for -15.000V +/- 10mV. Check both +5V supplies for +5.0V +/- 0.2V.

### SYNTH, BOARD 2

Connect DVM to emitter of Q1. Set +10V supply for +10.000V +/- 10mV by adjusting 10V ADJ trim R12.

### D/A CONVERTER ADJUSTMENT, BOARD 3

Pul OSC 1 LEVEL in edit and set to 0. Adjust D/A ZERO trim R60 for 0.000V +/- 2mV. (Connect DVM to U12 pin 1 on Synth Board 2.) Set OSC 1 LEVEL to 99. Adjust D/A FULL SCALE trim R62 for 10.000V +/- 2mV. Connect DVM to KB buss, Connector (P36-4), press high C and adjust KYBD trim R72 for 8.824V +/- 5mV.

## SYNTHESIZER CIRCUIT ALIGNMENT, BOARD 2

### OSC 1 SCALE ADJUST

Set control panel to the following:

GLIDE	0
MOD	OFF
OCT 1	32'
W/S 1	SAW
SYNC	OFF
OSC 1 LEVEL	99
NOISE	0
OSC 2 LEVEL	0
CUTOFF	0
EMPHASIS	0
COUTOUR AMT	99
Both SUSTAINS	99

All other contour functions  
KB TRANSPOSE  
Center Pitch Wheel

0  
0

OSC 2 H  
F  
adjust  
OSC 2 T  
R  
OSC 2 F  
Se  
O  
O  
IN

Connect reference oscillator set to 65Hz, through series 4.7K resistor and 10uF capacitor, to connector P23-7. Depress low C and zero beat using RANGE trim R127.

Depress high C and zero beat using SCALE trim R123. Check low C and repeat above procedure if necessary.

### OSC 1 OCTAVE ADJUST

Set up the same as for Scale Adjust.

Depress low C and zero beat using rear panel FINE TUNE R228. Change OSC 1 FOOTAGE to 8' and zero beat using OCT trim R122. Repeat until both ends zero beat.

### OSC 1 HIGH END COMPENSATION

Set up the same as for Scale Adjust except set OCT 1 to 8' and KB TRANSPOSE to +1.

Depress low C and zero beat using rear panel FINE TUNE R228. Depress high C and zero beat with Osc 1 HIGH trim R100.

### OSC 1 TUNE CHECK

When high end compensation is set, check SCALE and OCTAVE adjustments. If they have changed, repeat steps above until all are correct.

### OSC 2 SCALE

Set control panel the same as for Osc 1 Scale Adjust with the following exceptions:

OSC 2 LEVEL	99
OCT 2	32'
INTERVAL	1

The procedure is the same as for Osc 1 Scale Adjust except use OSC 1 as a reference pitch and adjust SCALE trim R72.

### OSC 2 OCTAVE ADJUST

Follow the same procedure used for Osc 1 except change OSC 2 FOOTAGE between 32' and 8' (OSC 1 FOOTAGE remains at 16') and adjust OCT trim R71.

TO  
STORE  
increm  
for zero  
INTERV  
Tu  
U7A, p  
a 10V t  
up and  
trim R7  
FILTER  
Se  
TF  
OS  
OS  
CL  
EM  
CO  
LO  
VO  
Sin  
ted to a  
trim R1  
FILTR  
Set  
Ladder  
LOUDN  
Ho  
of U40A  
the same

## OSC 2 HIGH END COMPENSATION

Follow the same procedure used for Osc 1 except adjust HIGH trim R39.

## OSC 2 TUNE CHECK

Refer to Osc 1 Tune Check procedure.

## OSC 2 RANGE ADJUST

Set the following controls:

OSC 1 OCTAVE	8'
OSC 2 OCTAVE	16'
INTERVAL	50

To access Osc 2 AUTO TUNE, press and hold STORE and press OSC 2 LEVEL. Set to 50 using incremental control knob. Adjust RANGE trim R78 for zero beats (unison).

## INTERVAL MONOTONICITY

Turn OSC 1 LEVEL to 0 and connect scope to U7A, pin 1 (2V/DIV DC). Turn up INTERVAL until a 10V transition occurs on scope. Move INTERVAL up and down through this transition and adjust INT trim R79 for a minimum pitch change.

## FILTER LADDER BALANCE

Set the following controls:

TRANPOSE	0
OSC 1 LEVEL	0
OSC 2 LEVEL	0
CUTOFF	0
EMPHASIS	0
CONTOUR AMT	0
LOUDNESS SUSTAIN-ATTACK-DECAY-RELEASE	0
VOLUME	max

Strike low C repeatedly and with scope connected to audio output jack J4, adjust LADDER BAL trim R167 for pulse of <50mV.

## FILTER LEVEL BALANCE

Set the control panel the same as for Filter Ladder Balance except set EMPHASIS to 99 and LOUDNESS SUSTAIN to 99.

Hold down low C key. Measure voltage on pin 3 of U40A and adjust LEVEL BAL trim R168 to obtain the same reading on pin 1 of U40A.

## FILTER EMPHASIS ADJUST

Using the same control panel settings as above except EMPHASIS at 80, adjust EMPH trim R164 until filter just begins to oscillate (observe on scope).

## FILTER, SCALE AND RANGE ADJUST

Return control panel settings to LEVEL BALANCE setup and place KB TRACKING to FULL. Connect reference oscillator in the same manner used for Osc 1 Scale Adjust except set frequency at 80Hz. Depress low C and zero beat using SCALE trim R155. Depress high C and zero beat by adjusting RANGE trim R152. Repeat above steps until both ends are correct.

## CUTOFF MONOTONICITY

Using the same control panel setup as in the previous step except CUTOFF at 50, connect scope to U8A, pin 1 (2V/DIV DC). Turn up CUTOFF control while watching for a 10V transition on scope. Turn CUTOFF control up and down just enough to cause this transition to occur and adjust CUTOFF trim R146 for minimum pitch change.

## FILTER CONTOUR ATTACK & DECAY TIME

Set the following controls:

ATTACK	99
DECAY	0
SUSTAIN	0
RELEASE	0

Connect scope to pin 7 of U43B (2V/DIV DC). Depress any key and adjust RANGE trim R201 for attack time of 8 seconds.

## FILTER CONTOUR BALANCE

Set the following controls:

CONTOUR AMT	99
ATTACK	0

Short pin 9 of U26 to ground. Adjust CONTOUR BAL trim R205 so that the voltage on pin 6 of U45 is 0.000V +/- 10mV with respect to ground.

## LOUDNESS CONTOUR ATTACK & DECAY TIME

Set up the same as for Filter Contour except connect scope to pin 1 of U43A and adjust RANGE trim R179.

# MODULATION OSC RATE

Connect DVM to pin 7 of U13B and scope to pin 7 of U48B. Turn MOD RATE control to obtain 5.2V reading. Adjust RANGE trim R223 for 7Hz (142.6 msec)  $\pm$  0.5Hz.

# GLIDE TIME

Set GLIDE to 99. Adjust RANGE trim R19 to yield glide time from low C to high C and vice versa between 3 to 5 seconds.

# CHIP TEMPERATURE ADJUSTMENT, BOARD 2

## NOTE

Oscillator chip temperature is factory set and should not need further adjustment. Do not adjust unless the oscillator IC or components in the temperature compensation circuit are changed or proper tuning can not be accomplished.

# OSC 1 CHIP TEMPERATURE ADJUSTMENT

Turn TEMP trim R131 fully counterclockwise (wiper at -0.6V) and leave in this position for about 10 minutes to allow chip to cool to room temperature.

- Measure emitter voltage of Q15 (pin 3 of U34) with respect to ground (use 1K in series with probe) and record reading ( $V_C$ ).
- Estimate room temperature in degrees C ( $T_R$ ).
- Subtract room temperature from 55°C to determine temperature rise needed to reach 55°C.
- Multiply result by 2mV. (Transistor VBE decreases by 2mV/°C.)
- Add this product to cold reading ( $V_C$ ) measured above to determine hot reading ( $V_H$ ).

Example:  $T_R = 22^\circ\text{C}$  (72°F);  $V_C = -616\text{mV}$ ;

$$V_H = V_C + 2(55 - T_R)$$

$$-616 + (2 \times 33) = -550\text{mV} = V_H$$

1) Adjust TEMP trim R131 to obtain reading determined above at emitter of Q15 (U34). Chip temperature now set at 55°C.

# OSC 2 CHIP TEMPERATURE ADJUSTMENT

Set up the control panel the same as for Osc 1 and follow the same procedure except TEMP trim R83 is adjusted to set voltage at emitter Q8 (pin 3 of U26).

# INCREMENTAL CONTROL CHECK, BOARD 3

## DUTY CYCLE

Attach a dual trace scope at U19 pin 6 ( $\phi 1$ ) and U19 pin 4 ( $\phi 2$ ). Rotate incremental control and note pulse duty cycle should be nominal 50%  $\pm$  25%. Check clockwise and counterclockwise rotation.

## PHASE RELATIONSHIPS

Using same setup as above, check phase of the positive edge of  $\phi 1$  in comparison to  $\phi 2$  at approximately 250 RPM (1kHz output frequency). Positive edge of  $\phi 1$  should be at 50%  $\pm$  10% of  $\phi 2$  pulse width. Since adjustment of phase requires a change in gap between VO1 and VO2 OPTO interruptors, malfunctioning unit should be replaced with a factory adjusted assembly.

# REPLACEMENT PARTS LIST

## STANDARDIZED COMPONENTS

Ref. Design	DESCRIPTION	PART NO. (REV.)
R1X	Resistor, 1/4W, 5%, Carbon Film [Resistance (X)(X)(X) Multiplier]	862-312RXX-001
R1R	Resistor, 1/4W, 1%, Metal Film [Resistance (X)(X)(X) Multiplier]	862-42XXRX-001

## MISCELLANEOUS PRINTED CIRCUIT BOARDS, BOARD 4, BOARD 5 AND BOARD 6

Ref. Design	DESCRIPTION	PART NO.
P47	Header, OS, Right Angle, 100 Pins	810-042382-005
LED 1,2,3	LED, Red	829-041860-004
U1	IC, Decoder/Driver, 7441	891-041087-001
U2	Display, 1-1/2 Digit, MN, 8830	838-042633-001
U3	IC, Decoder/Driver, 7447	891-041087-001
U4	Display, 1 Digit, MAX, 3810A	838-045310-001
U5	IC, Decoder/Driver, 7447	891-041087-001
U6	Display, 1 Digit, MAX, 3810A	838-045310-001
C1, C2	Capacitor, Tantalum, .01 $\mu$ F	94T-045011-103
R26	Resistor, Network, 5K, 10% Log. VOLUME	825-045223-001
S81	Switch, Blue, 11	965-040223-016
S82	Switch, Blue, 0	965-040223-011
VO1, VO2	Opto-Interrupter, MCT8	838-045311-001
O1, O2	1 Channel, 10PM, 242004	991-041061-002



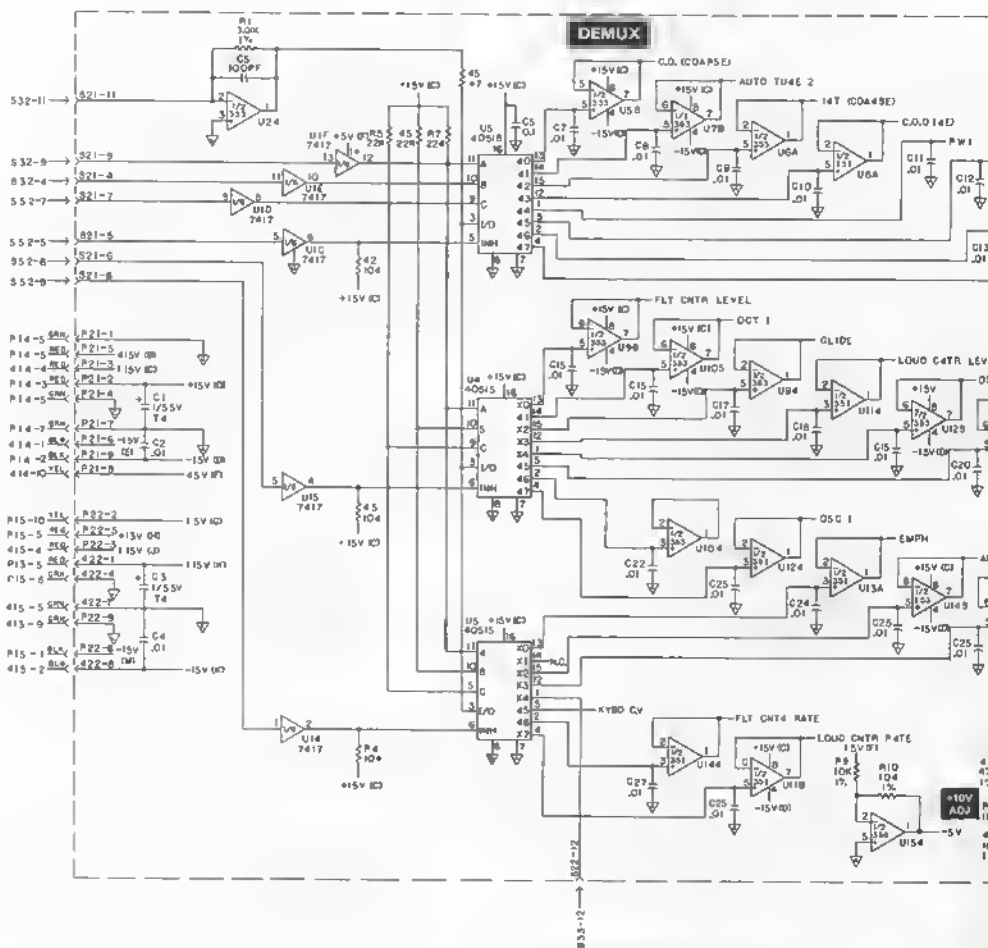
PN# DESG	DESCRIPTION	QTY REQD
BD 1	C. Board Assy, Power Supply	906-045281-001
BD 2	C. Board Assy, Power Supply, Backup	906-045281-002
BD 3	C. Board Assy, Buffer/Driver	906-045296-001
BD 4	C. Board Assy, Digital	906-045298-001
BD 5	C. Board Assy, Display	906-045278-001
BD 6	C. Board Assy, Octave	906-045175-001
BD 8	P.C. Board Assy, Opto-Interconnect Incremental Controller Assy	906-045172-001 901-040525-001
F1	Fuse, Do-35, 1/2 Ampere, 2AG	908-041620-003
*B1, B3	1 Vol, 250Ma, 5M + 20M	908-040404-006
B4	100k, 1/4W, 5M + 20M	908-040404-001
J1	Connector, 8 Pin, DIN	910-045327-005
J2	Jack, Phone, 3 Conductor, 250 Dia	910-041300-004
J3	Jack, Phone, 3 Conductor, 250 Dia	910-041306-011
J4	Jack, Phone, 1 Cir., 250 Dia	910-041808-001
B126	Potentiometer, Rotary, 10K Lin., B191 TUNE	975-040506-001
R229	Potentiometer, Rotary, 10K Lin., PTCH 9941 L	975-040306-003
R230	Potentiometer, Rotary, 10K, Special Type	925-040298-001
MOD W111 L		910-047511-001
S1	Receptacle, DCE 72	908-040298-003
B13, S14, S15	Connector, CIS, Socket, 8 Pin, 1 Cir	906-040298-008
S24, S25	Connector, CIS, Socket, 8 Pin, 1 Cir	906-040298-005
S31, S31B	Connector, CIS, Socket, 1 Pin, 1 Cir	906-040298-001
S38, S38B	Connector, CIS, Socket, 3 Pin, 1 Cir	906-040298-004
S39	Connector, CIS, Socket, 2 Pin, 1 Cir	906-040298-002
S41, S42	Connector, Socket, 6 Pin, 189 Cir	906-041406-003
SW1	Switch, Rocker, DPST, 250V, 6A	904-042800-001
T1	Transformer, 110V/230V	951-045288-001
	Bracket, Base Assembly	908-041331-001
	Bracket, Base Assy	908-040291-001
	Heat Sink, Copper, Power Supply	988-040321-001
	Socket, No. 4-40 x 1/4 In., 1/4 In. Insulator, Mica, 118 Trans.	903-040216-1-001
	Washer, Metal, Shoulder	908-041779-001
	Seal, 1/8 In. Dia	908-041679-001
	Base Chip, B.C. Mat., 5mm	906-040305-001
	1 Pin SIB IC Socket	906-040301-001
	8 Pin DIB IC Socket	906-040701-2-008
	10 Pin SIB IC Socket	906-040301-010
	14 Pin DIP IC Socket	906-040519-014
	10 Pin DIB IC Socket	906-040819-010
	24 Pin DIB IC Socket	906-045188-001
	18 Pin DIB IC Socket	906-045188-024
	40 Pin DIB IC Socket	906-045188-040
	Wheel Assembly	911-041991-014
	Set Screw, Allen	903-040486-002
	Detent, Spring	901-041179-001
	Detent, T/H Pin	903-041179-001
	Knob Assy, Detent	918-041164-041
	Knob, 1/8" Dia	915-045321-001
	Keying Pin	910-040030-001
	Power Cord, USA, 120V, 1W/4W, B-15P	951-041784-001
	Power Cord, European, 250V, 1 Pin B	951-043400-001
	Power Cord, Australian, 250V, 1 Pin B	951-043400-002
	Power Cord, Swiss, 250V, 1 Pin C	951-043400-003
	Power Cord, UK, 250V, 1 Pin D	951-043400-004
	1 Pin, Bulb, 7.5W, 250V	975-045150-001
	Keyboard Assy, 31 Keys, 2 Pin C	903-040310-001
	Machine Screw #15 x 1/2 In.	904-040471-001
	White Key C	904-040481-1-002
	White Key E	904-040481-1-002
	White Key B	904-040481-1-004
	White Key G	904-040481-1-005
	White Key A	904-040481-1-006
	White Key B	904-040481-1-008
	Black Key	904-040481-1-009
	Switch No. 1	975-040481-3-001
	Switch Unit No. D	900-040481-4-001
	Switch Unit No. 1	900-040481-4-002
	Damper Rib	914-040475-002
	Damper Rib	915-045299-040
	Calibration Assy, Without Overlay	915-045292-001
	Overlay, Display	915-045293-001
	Overlay, L/H Hand Controller	915-045293-001
	Label, Rating, Domestic, 120V	915-045293-001
	Label, Rating, Exports, 230V	901-045293-001
	Base Plate	903-045292-001
	Owner's Manual	901-045292-001
	Owner's Information Leaflet	901-045292-001
	Shipping Carton	903-045291-002
	1 Filter, 50k, 1 Ohm	903-045345-001
	Insert Board	903-045346-001
	B.C. Board Chip, Nylon	973-045296-001
	Membrane Switch Panel	900-045294-001

\*Bipolar Model Only

PN# DESG	DESCRIPTION	QTY REQD
P21	B Pin CIB Header, 1 Cir	910-040299-008
P22	9 Pin CIB Header, 1 Cir	910-040299-001
P23	1 Pin CIB Header, 1 Cir	910-040299-001
P24	1 Pin CIB Header, 1 Cir	910-040299-003
U1	IC, 1411 Her. Buffer	901-045305-001
U2	IC, 353 Dual Operational Amplifier	901-040298-001
U3	IC, 4051B CMOS B CH Multiplexer	901-040298-001
U4	IC, 4051B CMOS B CH Multiplexer	901-040298-001
U6	IC, 353 Dual Operational Amplifier	901-040298-001
U7	IC, 353 Dual Operational Amplifier	901-040298-001
U8	IC, 353 Dual Operational Amplifier	901-040298-001
U9	IC, 353 Dual Operational Amplifier	901-040298-001
U10	IC, 353 Dual Operational Amplifier	901-040298-001
U11	IC, 353 Dual Operational Amplifier	901-040298-001
U12	IC, 353 Dual Operational Amplifier	901-040298-001
U13	IC, 353 Dual Operational Amplifier	901-040298-001
U14	IC, 353 Dual Operational Amplifier	901-040298-001
U15	IC, 353 Dual Operational Amplifier	901-040298-001
U16	IC, 353 Dual Operational Amplifier	901-040298-001
U17	IC, 3080A OTA	901-040804-001
U18	IC, 4018B CMOS Quad Switch	901-040804-001
U19	IC, 4007B CMOS Dual Complementary Pair	901-040804-001
U20	IC, 353 Dual Operational Amplifier	901-040298-001
U21	IC, 3290A Dual Comparator	901-040355-001
U22	IC, 1411 Her. Buffer	901-045305-001
U23	IC, 4018B CMOS Quad Switch	901-040804-001
U24	IC, 3080A OTA	901-040804-001
U25	IC, 353 Dual Operational Amplifier	901-040298-001
U26	IC, 3080A 1 Volt. Array	951-041104-002
U27	IC, 353 Dual Operational Amplifier	901-040804-001
U28	IC, 9811 Noise Generator	951-040298-001
U29	IC, 3080A OTA	901-040804-001
U30	IC, 353 Dual Operational Amplifier	901-040298-001
U31	IC, 4018B CMOS Quad Switch	901-040355-001
U32	IC, 4018B CMOS Quad Switch	901-040804-001
U33	IC, 3080A OTA	901-040804-001
U34	IC, 3080A 1 Volt. Array	951-041104-002
U35	IC, 353 Dual Operational Amplifier	901-040298-001
U36	IC, 4018B CMOS Quad Switch	901-040355-001
U37	IC, 3080A 1 Volt. Array	951-041104-002
U38	IC, 3080A OTA	901-040804-001
U39	IC, 3080A OTA	901-040804-001
U40	IC, 4548 Dual Operational Amplifier	901-041104-001
U41	IC, 3080A 1 Volt. Array	951-041104-002
U42	IC, 3080A OTA	901-040804-001
U43	IC, 353 Dual Operational Amplifier	901-040298-001
U44	IC, 3080A OTA	901-040804-001
U45	IC, 3080A OTA	901-040804-001
U46	IC, 4018B CMOS Quad Switch	901-040355-001
U47	IC, 4007B CMOS Dual Complementary Pair	901-040804-001
U48	IC, 353 Dual Operational Amplifier	901-040298-001
U49	IC, 3080A OTA	901-040804-001
Q1	Transistor, NPN, 2N3906	901-040101-002
Q2	Transistor, PNP, 2N2906	901-040101-002
Q3	Transistor, NPN, 2N3904	901-040101-002
Q4	Transistor, PNP, 2N2906	901-040101-002
Q5	Transistor, PNP, 2N3906	901-040101-002
Q6	Transistor, NPN, 2N3906	901-040101-002
Q7	Transistor, PNP, 2N3906	901-040101-002
Q8	Transistor, NPN, 2N3906	901-040101-002
Q9	Transistor, PNP, 2N3906	901-040101-002
Q10	Transistor, NPN, 2N3906	901-040101-002
Q11	Transistor, PNP, 2N3906	901-040101-002
Q12	Transistor, NPN, 2N3906	901-040101-002
Q13	Transistor, PNP, 2N3906	901-040101-002
Q14	Transistor, NPN, 2N3906	901-040101-002
Q15	Transistor, PNP, 2N3906	901-040101-002
Q16	Transistor, NPN, 2N3906	901-040101-002
Q17	Transistor, PNP, 2N3906	901-040101-002
Q18	Transistor, NPN, 2N3906	901-040101-002
Q19	Transistor, PNP, 2N3906	901-040101-002
Q20	Transistor, NPN, 2N3906	901-040101-002
Q21	Transistor, PNP, 2N3906	901-040101-002
Q22	Transistor, NPN, 2N3906	901-040101-002
Q23	Transistor, PNP, 2N3906	901-040101-002
Q24	Transistor, NPN, 2N3906	901-040101-002
Q25	Transistor, PNP, 2N3906	901-040101-002
Q26	Transistor, NPN, 2N3906	901-040101-002
Q27	Transistor, PNP, 2N3906	901-040101-002
Q28	Transistor, NPN, 2N3906	901-040101-002
Q29	Transistor, PNP, 2N3906	901-040101-002
Q30	Transistor, NPN, 2N3906	901-040101-002
Q31	Transistor, PNP, 2N3906	901-040101-002
Q32	Transistor, NPN, 2N3906	901-040101-002
Q33	Transistor, PNP, 2N3906	901-040101-002
Q34	Transistor, NPN, 2N3906	901-040101-002
Q35	Transistor, PNP, 2N3906	901-040101-002
Q36	Transistor, NPN, 2N3906	901-040101-002
Q37	Transistor, PNP, 2N3906	901-040101-002
Q38	Transistor, NPN, 2N3906	901-040101-002
Q39	Transistor, PNP, 2N3906	901-040101-002
Q40	Transistor, NPN, 2N3906	901-040101-002
Q41	Transistor, PNP, 2N3906	901-040101-002
Q42	Transistor, NPN, 2N3906	901-040101-002
Q43	Transistor, PNP, 2N3906	901-040101-002
Q44	Transistor, NPN, 2N3906	901-040101-002
Q45	Transistor, PNP, 2N3906	901-040101-002
Q46	Transistor, NPN, 2N3906	901-040101-002
Q47	Transistor, PNP, 2N3906	901-040101-002
Q48	Transistor, NPN, 2N3906	901-040101-002
Q49	Transistor, PNP, 2N3906	901-040101-002
Q50	Transistor, NPN, 2N3906	901-040101-002
Q51	Transistor, PNP, 2N3906	901-040101-002
Q52	Transistor, NPN, 2N3906	901-040101-002
Q53	Transistor, PNP, 2N3906	901-040101-002
Q54	Transistor, NPN, 2N3906	901-040101-002
Q55	Transistor, PNP, 2N3906	901-040101-002
Q56	Transistor, NPN, 2N3906	901-040101-002
Q57	Transistor, PNP, 2N3906	901-040101-002
Q58	Transistor, NPN, 2N3906	901-040101-002
Q59	Transistor, PNP, 2N3906	901-040101-002
Q60	Transistor, NPN, 2N3906	901-040101-002
Q61	Transistor, PNP, 2N3906	901-040101-002
Q62	Transistor, NPN, 2N3906	901-040101-002
Q63	Transistor, PNP, 2N3906	901-040101-002
Q64	Transistor, NPN, 2N3906	901-040101-002
Q65	Transistor, PNP, 2N3906	901-040101-002
Q66	Transistor, NPN, 2N3906	901-040101-002
Q67	Transistor, PNP, 2N3906	901-040101-002
Q68	Transistor, NPN, 2N3906	901-040101-002
Q69	Transistor, PNP, 2N3906	901-040101-002
Q70	Transistor, NPN, 2N3906	901-040101-002
Q71	Transistor, PNP, 2N3906	901-040101-002
Q72	Transistor, NPN, 2N3906	901-040101-002
Q73	Transistor, PNP, 2N3906	901-040101-002
Q74	Transistor, NPN, 2N3906	901-040101-002
Q75	Transistor, PNP, 2N3906	901-040101-002
Q76	Transistor, NPN, 2N3906	901-040101-002
Q77	Transistor, PNP, 2N3906	901-040101-002
Q78	Transistor, NPN, 2N3906	901-040101-002
Q79	Transistor, PNP, 2N3906	901-040101-002
Q80	Transistor, NPN, 2N3906	901-040101-002
Q81	Transistor, PNP, 2N3906	901-040101-002
Q82	Transistor, NPN, 2N3906	901-040101-002
Q83	Transistor, PNP, 2N3906	901-040101-002
Q84	Transistor, NPN, 2N3906	901-040101-002
Q85	Transistor, PNP, 2N3906	901-040101-002
Q86	Transistor, NPN, 2N3906	901-040101-002
Q87	Transistor, PNP, 2N3906	901-040101-002
Q88	Transistor, NPN, 2N3906	901-040101-002
Q89	Transistor, PNP, 2N3906	901-040101-002
Q90	Transistor, NPN, 2N3906	901-040101-002
Q91	Transistor, PNP, 2N3906	901-040101-002
Q92	Transistor, NPN, 2N3906	901-040101-002
Q93	Transistor, PNP, 2N3906	901-040101-002
Q94	Transistor, NPN, 2N3906	901-040101-002
Q95	Transistor, PNP, 2N3906	901-040101-002
Q96	Transistor, NPN, 2N3906	901-040101-002
Q97	Transistor, PNP, 2N3906	901-040101-002
Q98	Transistor, NPN, 2N3906	901-040101-002
Q99	Transistor, PNP, 2N3906	901-040101-002
Q100	Transistor, NPN, 2N3906	901-040101-002

REF DESIG	DESCRIPTION	PART NO
C85	Diode, Signal, 1N4148	910-041075-001
C86	Diode, Signal, 1N4148	910-041075-001
C87	Diode, Signal, 1N4148	910-041075-001
C88	Diode, Signal, 1N4148	910-041075-001
C1	Capacitor, Tantalum, 1 uF/35V	946-040231-008
C2	Capacitor, Tantalum, .01 uF	947-040511-103
C3	Capacitor, Tantalum, .01 uF/35V	946-040231-009
C4	Capacitor, Tantalum, .01 uF	947-040511-103
C5	Capacitor, Tantalum, 100 pf	947-040506-101
C6	Capacitor, Monolithic, 0.1 uF	947-040512-104
C7	Capacitor, Polyester, .01 uF	946-041878-103
C8	Capacitor, Polyester, .01 uF	946-041878-103
C9	Capacitor, Polyester, .01 uF	946-041878-103
C10	Capacitor, Polyester, .01 uF	946-041878-103
C11	Capacitor, Polyester, .01 uF	946-041878-103
C12	Capacitor, Polyester, .01 uF	946-041878-103
C13	Capacitor, Polyester, .01 uF	946-041878-103
C14	Capacitor, Polyester, .01 uF	946-041878-103
C15	Capacitor, Polyester, .01 uF	946-041878-103
C16	Capacitor, Polyester, .01 uF	946-041878-103
C17	Capacitor, Polyester, .01 uF	946-041878-103
C18	Capacitor, Polyester, .01 uF	946-041878-103
C19	Capacitor, Polyester, .01 uF	946-041878-103
C20	Capacitor, Polyester, .01 uF	946-041878-103
C21	Capacitor, Monolithic, 3 uF	947-040512-104
C22	Capacitor, Polyester, .01 uF	946-041878-103
C23	Capacitor, Polyester, .01 uF	946-041878-103
C24	Capacitor, Polyester, .01 uF	946-041878-103
C25	Capacitor, Polyester, .01 uF	946-041878-103
C26	Capacitor, Polyester, .01 uF	946-041878-103
C27	Capacitor, Polyester, .01 uF	946-041878-103
C28	Capacitor, Polyester, .01 uF	946-041878-103
C29	Capacitor, Polyester, .01 uF	946-041878-103
C30	Capacitor, Polyester, .01 uF	946-041878-103
C31	Capacitor, Tantalum, 100 pf	947-040506-101
C32	Capacitor, Polyester, 22 uF	946-041878-103
C33	Capacitor, Polyester, .001 uF	946-041878-102
C34	Capacitor, Tantalum, 100 pf	947-040506-101
C35	Capacitor, Tantalum, 470 pf	947-040506-101
C36	Capacitor, Tantalum, .01 uF	947-040511-103
C37	Capacitor, Tantalum, .01 uF	947-040506-101
C38	Capacitor, Tantalum, 47 pf	947-040506-101
C39	Capacitor, Polyester, 0.1 uF	946-041878-104
C40	Capacitor, Polyester, .008 uF	947-040512-104
C41	Capacitor, Polyester, .018 uF	946-041878-103
C42	Capacitor, Polyester, 22 uF	946-041878-103
C43	Capacitor, Polyester, 22 uF	946-041878-103
C44	Capacitor, Tantalum, 100 pf	947-040506-101
C45	Capacitor, Tantalum, 470 pf	947-040506-101
C46	Capacitor, Polyester, 47 uF	946-041878-104
C47	Capacitor, Polyester, 47 uF	946-041878-104
C48	Capacitor, Aluminum Electrolytic, 220 uF/35V	946-041878-103
C49	Capacitor, Polyester, .01 uF	946-041878-103
C50	Capacitor, Polyester, .01 uF	946-041878-103
C51	Capacitor, Polyester, .01 uF	946-041878-103
C52	Capacitor, Polyester, .01 uF	946-041878-103
C53	Capacitor, Polyester, .01 uF	946-041878-103
C54	Capacitor, Tantalum, 470 pf	947-040506-101
C55	Capacitor, Aluminum Electrolytic, 10 uF/16V	946-041878-103
C56	Capacitor, Polyester, .047 uF	946-041878-103
C57	Capacitor, Polyester, .047 uF	946-041878-103
C58	Capacitor, Polyester, .33 uF	946-041878-103
C59	Capacitor, Monolithic, 0.1 uF	947-040512-104
R12, R38	Resistor, Trim Pot, Carbon, 10K	925-040275-004
R18	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R19	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R20	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R21	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R22	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R23	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R24	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R25	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R26	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R27	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R28	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R29	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R30	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R31	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R32	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R33	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R34	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R35	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R36	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R37	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R38	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R39	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R40	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R41	Resistor, Trim Pot, Carbon, 100K	925-040275-001
R42	Resistor, Trim Pot, Carbon, 100K	925-040275-001

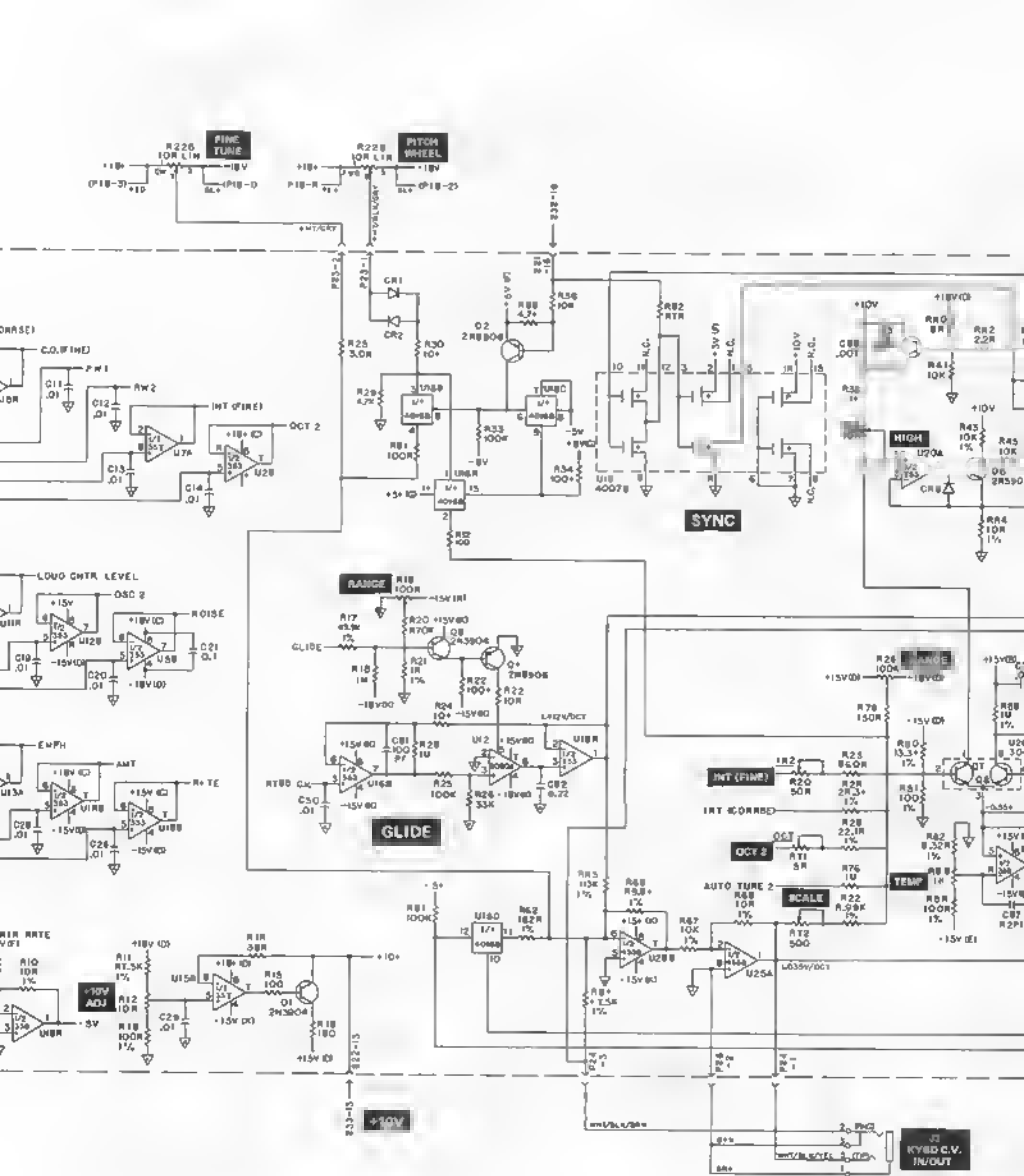
REF DESIG	DESCRIPTION	PART NO
P31	8 Position Flat Cable Connector	910-0405148-006
P32	6 Position Flat Cable Connector	910-0405148-006
P33	6 Position Flat Cable Connector	910-0405148-006
P34	6 Pin CTS Header, 1 Cts	910-040296-005
P35	4 Pin CTS Header, 1 Cts	910-040296-004
P36	4 Pin CTS Header, 1 Cts	910-040296-004
P37	7 Pin CTS Header, 1 Cts	910-040296-007
P38	8 Pin CTS Right Angle Header, 1 Cts, Keyed	910-040296-008
B1	Battery, Lithium, 3V	925-040513-201
Y1	Crystal, Quartz, 4MHz	921-040313-001
K1	Relay, Reed, 500 Ohm Cpl	921-040511-103
U1	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U2	IC, 7404, Hex Inverter	991-040304-001
U3	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U4	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U5	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U6	IC, 74LS204, Hex Inverter	991-040358-001
U7	IC, 74LS204, Hex Inverter	991-040358-001
U8	IC, 4507B, CMOS Hex Inverter	991-040358-001
U9	IC, 4507B, CMOS Hex Inverter	991-040358-001
U10	IC, 74LS04, Hex Inverter	991-040358-001
U11	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U12	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U13	IC, 74LS155, Dual Decade	991-040358-001
U14	IC, 74LS393, Dual Binary Counter	991-040358-001
U15	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U16	IC, 74LS04, Hex Inverter	991-040358-001
U17	IC, 74LS204, Hex Inverter	991-040358-001
U18	IC, 74LS204, Hex Inverter	991-040358-001
U19	IC, 40108B, CMOS Hex Schmitt	991-040358-001
U20	IC, 40138 CMOS Dual D, Flip-Flop	991-040358-001
U21	IC, 74LS393, Dual Binary Counter	991-040358-001
U22	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U23	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U24	IC, 2801 CPU	991-040358-001
U25	IC, 74LS204, Hex Inverter	991-040358-001
U26	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U27	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U28	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U29	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U30	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U31	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U32	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U33	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U34	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U35	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U36	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U37	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U38	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U39	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U40	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U41	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U42	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U43	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U44	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U45	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U46	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U47	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U48	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U49	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U50	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U51	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U52	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U53	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U54	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U55	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U56	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U57	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U58	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U59	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U60	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U61	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U62	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U63	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U64	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U65	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U66	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U67	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U68	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U69	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U70	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U71	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U72	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U73	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U74	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U75	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U76	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U77	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U78	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U79	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U80	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U81	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U82	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U83	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U84	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U85	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U86	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U87	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U88	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U89	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U90	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U91	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U92	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U93	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U94	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U95	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U96	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U97	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U98	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U99	IC, 74LS378, Hex D, Flip-Flop	991-040358-001
U100	IC, 74LS378, Hex D, Flip-Flop	991-040358-001

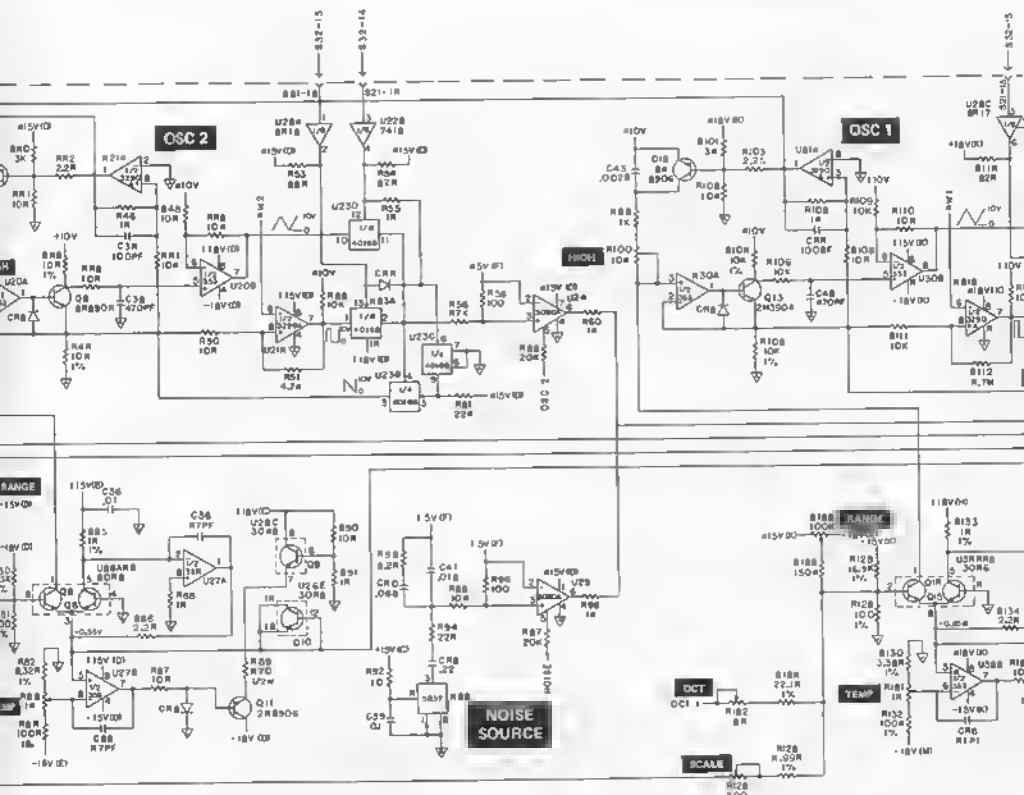


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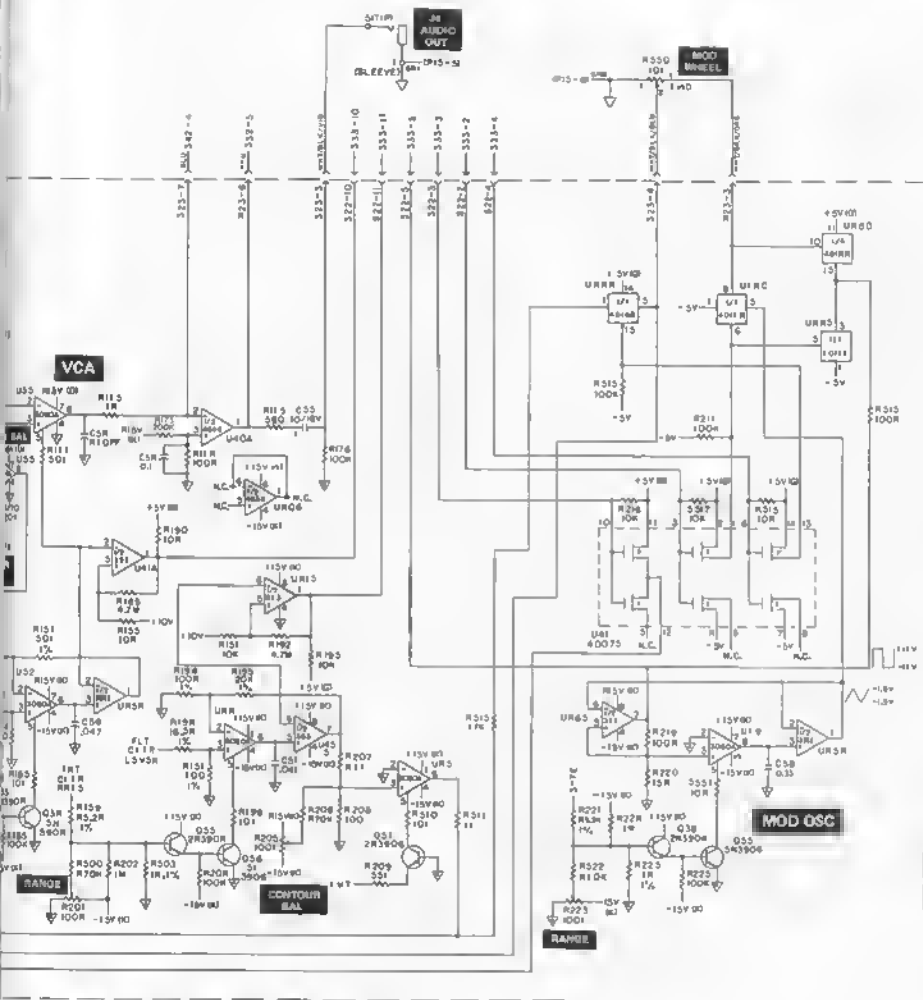




15  
 KVRDC V.  
 INPUT

NOTES  
 UNLESS OTHERWISE SPECIFIED:  
 ALL RESISTORS ARE IN OHMS UNLESS OTHERWISE SPECIFIED  
 ALL CAPACITORS ARE IN PFD (pF)  
 ALL OPDLS ARE IN INH  
 ALL  $\nabla$  ARE DIGITAL GND  
 ALL  $\nabla$  ARE ANALOG GND





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BOARD 2

THE SOURCE SYNTHESIZER BOARD SCHEMATIC

Part Number: 997-845, 945-994

February 9, 1983

SOURCE ADDENDA - Software Revisions  
3.2 and above



MUSIC INC.  
2540 Walker Avenue  
Bulldo, NY 14225

Phone (716) 681-7200

#### SEQUENCER TRANSPOSE

The sequencer may be transposed by the keyboard. The "zero" point - point of no transposition - is the first note of the sequence, transposed to the middle octave of the keyboard. For example:

- o A sequence is recorded starting on low F#.

- o When this sequence is played back, F# in the middle octave is the zero point; playing this key will have no effect on the pitch of the sequence. Playing any other key will transpose the sequence.

Basing the transpose function in the middle octave allows any sequence to be transposed up or down, no matter where on the keyboard the original sequence was played. Note that this expands the instrument's range above and below the normal keyboard span.

Stopping the sequencer and restarting it with the CONTINUE function will retain the last transposition. Starting the sequencer with the PLAY function will cancel all transposition.

#### DRUM INTERFACE

Your SOURCE has several new rear panel connections not mentioned in the owner's manual. They are used to interface THE SOURCE with the various drum and rhythm units currently on the market.

The DIN connector (formerly used for cassette connections) is now used to connect to drum machines made by Roland and others who use these types of connectors. This connection allows the drum unit's CLOCK to also drive THE SOURCE's sequencers. The 12' DIN cable that connects THE SOURCE and the drum unit is available from the Moog Service Department. The TRIGGER IN jack connects to any output from a drum unit that puts out a trigger. ONLY on the downbeat. This trigger restarts the sequencer or steps the arpeggiator so the drumbeat and sequence will always be synchronized.

#### RECORDING A SEQUENCE FOR USE WITH A DRUM UNIT:

- o Start the drum unit. This ensures that both instruments will be synchronized.
- o Set THE SOURCE for sequencer record (as explained in the manual).
- o On the downbeat, play the desired sequence.

NOTE: Be sure to release the last note before this final downbeat. For best synchronization, hit STOP slightly after the downbeat.

#### PLAYING BACK A SEQUENCE IN SYNCHRONIZATION:

- o On THE SOURCE, hit LEVEL 2, then SEQUENCE PLAY. With the drum interface connections in place, THE SOURCE will not play.
- o At the desired time, start the playback of the drum unit. THE SOURCE will immediately begin playing the sequence in synchronization with the drum unit.

NOTE: The trigger pulse provided by the drum unit automatically restarts the sequence. Make sure to hit STOP at the right time when recording the sequence or else the final note may be "chopped off" due to it playing when the sequence restarts.



#### CASSETTE INTERFACE

The cassette routine for storage and retrieval of digital program information has been improved to work with a greater variety of cassette recorders. The front panel controls function as explained in the owner's manual but the rear panel connections and display indicators have been updated.

The jack labeled FROM TAPE should be connected to the earphone or headphone output for best results, but a line level signal may also be used. The REMOTE jack should be used if the cassette recorder has a remote microphone on/off switching input. The TO TAPE jack should be connected to the aux or line input on the cassette recorder.

If you are using a stereo cassette recorder, be sure to only use one channel and make sure the inputs and outputs are connected to the same channel. The connectors used between THE SOURCE and a cassette recorder may be purchased locally from any electronics distributor.

When loading information from cassette, be sure the tape is wound back to the beginning of the "tone leader". If the tape is not wound enough, THE SOURCE may receive only a partial load. Note the tape counter settings carefully before starting any cassette operation.

#### SOUND CHARTS

The sound charts of the factory programs are approximate. Some controls, such as OSC 2 FREQUENCY and FILTER CUTOFF, have resolution higher than the incremental readout can display. Small differences from instrument to instrument may result in a setting that does not exactly match the manual. As long as the program sounds correct, it is not a problem.

#### ERRATA

Page 1 - Line 3 - Phrase should read "harmful static charges".

Page 22 - In the second paragraph of #3, change "blank leader" to "tone leader" with the display indicating "20" instead of "CC". As data is being saved, the display will indicate a closed parenthesis "}" instead of "So".

- In the two lines after the #1, change "blank leader" to "tone leader".

Page 44 - All "eighth-notes" should be "sixteenth-notes".

Page 49-50 - The trigger cable diagrams should be reversed; on the older version instruments, the TRIG IN/OUT jack output signal appears at the ring, and the input connection is at the tip. Note that older versions split the shorting trigger (S-Trig) into both an S-TRIG INPUT and S-TRIG OUTPUT.

Page 49 - First sentence - delete "and filter".

MANUFACTURER and MODEL	IN/OUT CONFIGURATION	MODEL & S/N	IN/OUT CONFIGURATION	SPECIAL NOTES
ROLAND DR. RHYTHM	CLOCK ACCENT	OUT-1/8" MINIJACK.....SOURCE>3180 OUT-1/8" MINIJACK.....SOURCE>3180	SYNC TRIGGER IN	5 PIN DIN JACK Rewire Taurus cable 957-045453-001. 1/4" PHONE JACK Buy or fabricate locally.
ROLAND CR-6000 COMPUTHRM	CLOCK STEP	OUT-AVAILABLE INSIDE...SOURCE>3180 OUT-1/4" PHONE JACK...SOURCE>3180	SYNC TRIGGER IN	5 PIN DIN JACK Rewire Taurus cable 957-045453-001. 1/4" PHONE JACK Use standard cable.
ROLAND DRUMATIX TR-606	CLOCK/SYNC TRIGGER	OUT-5 PIN DIN JACK...SOURCE>3180 OUT-(2)1/8" MINIJACKS...SOURCE>3180	SYNC TRIGGER IN	5 PIN DIN JACK Use Taurus cable 957-045453-001. 1/4" PHONE JACK Buy or fabricate locally.
ROLAND TR-808 KORG	CLOCK/SYNC TRIGGER	OUT-5 PIN DIN JACK...SOURCE>3180 OUT-1/4" PHONE JACK...SOURCE>3180	SYNC TRIGGER IN	5 PIN DIN JACK Use Taurus cable 957-045453-001. 1/4" PHONE JACK Use standard guitar cable.
KPR-77	TRIGGER	OUT-1/4" PHONE JACK...SOURCE>3285X	TRIGGER IN	1/4" PHONE JACK Requires DIN rewiring. Use standard guitar cable.
E-MU SYSTEMS INC. DRUMULATOR	CLOCK TRIGGER	OUT-RCA PIN"PHONO" JACK.SOURCE>3180 OUT-RCA PIN"PHONE" JACK.SOURCE>3285X	SYNC TRIGGER IN	5 PIN DIN JACK No direct interface. 1/4" PHONE JACK needs "pulsed" clock signal.
WILL WORK WITH DR. CLICK				
LINN ELECTRONICS LINNDROM	SYNC TRIGGER	OUT-1/4" PHONE JACK...SOURCE>3180 OUT-1/4" PHONE JACK...SOURCE>3285X	SYNC TRIGGER IN	5 PIN JACK No direct interface. 1/4" PHONE JACK needs "pulsed" clock signal.
GARFIELD ELECTRONICS DR. CLICK	SYNC STEP(?)	OUT-5 PIN DIN JACK...SOURCE>3180 OUT-1/4" PHONE JACK...SOURCE>3285X	SYNC TRIGGER IN	5 PIN DIN JACK Use Taurus cable 957-045453-001. 1/4" PHONE JACK Use standard guitar cable.
OBERHEIM DMX	----- USE DR. CLICK -----	SOURCE>3180 SOURCE>3285X	SYNC TRIGGER IN	5 PIN DIN JACK No direct interface. 1/4" PHONE JACK needs "pulsed" clock signal.
777FUTURE???	.....SOURCE>3285X	TRIGGER IN	1/4" PHONE JACK needs "pulsed" clock signal.	
ANY MANUFACTURER'S SEQUENCERS	VARIOUS.....SOURCE ALL VARIOUS.....SOURCE ALL	"Will not interface due to software generated trigger in Source."		
MOOG TAURUS II	C/V OUT	1/4" PHONE JACK.....SOURCE ALL	KB-CV IN/OUT	1/4" STEREO JACK "TIP" to "RING" cable 957-046077-901
"CONTROLLER"	S-TRIGGER	1/4" PHONE JACK.....SOURCE ANY	S-TRIG IN	1/4" VARIOUS JACKS Use standard guitar cable. Pitch output is additive and drifts slightly during "source only" usage. Add DPDT External Synthesizer switch to Taurus. See Interface Note #1.
MOOG TAURUS II "SYNTHESIZER"	KYBD IN/OUT 1/4" STEREO JACK.....SOURCE ALL TRIG IN/OUT 1/4" STEREO JACK.....SOURCE ANY	KB-CV IN/OUT 1/4" STEREO JACK "TIP" to "RING" cable w/IK pot. S-TRIG IN 1/4" VARIOUS JACKS Use standard guitar cable.		Connection requires pitch. See Interface Note #2.
OTHER MANUFACTURER'S PITCH OUT VARIOUS JACKS.....SOURCE ALL SYNTHESIZERS	GATE OUT VARIOUS JACKS.....SOURCE ANY	KB-CV IN/OUT 1/4" STEREO JACK "TIP" to "RING" w/IK pot. S-TRIG IN unusable jack. Add circuitry for GATE (V-TRIG). Rescale pitch.		Interface Notes #2 and #3.

## DIGITAL BOARD MODIFICATIONS

DELETE	ADD	PART NUMBER	COMMENTS
R2 470 OHM	R2 1K OHM	852-317102-001	Update schematic
C1 .1 uf	C1 .01 uf	947-045183-103	Update schematic
Jumper at the C2 location.	Step 1 - mount and solder C2, a 2.2 uf/25V capacitor with negative side towards P37-3.	945-040209-014	Update schematic by showing R8 $\frac{1}{2}$ from ground to the negative side of C2.
	Step 2 - Mount a 100K, R89 from right side of R2 to negative side of C2.	852-312104-001	
R3 22K	Deletion only	Not applicable	Update schematic.
R63 100 Ohm	R63 10K	852-312103-001	Update schematic
C15 .01uf	C15 .1uf	946-041978-104	Update schematic
R65 22K	R65 Add 100K from top of old R65 location to the bottom of CR16 location (CR16 location is not used).	852-312104-001	Update schematic by showing R65 from +5V to U30 Pin 5.
R68 47K Ohm	R68 100K Ohm	852-312104-001	Update schematic
R67 750K Ohm	R67 100K Ohm	852-312104-001	Update schematic
R66 47K Ohm	R66 100K Ohm	852-312104-001	Update schematic
R69 4.7M Ohm	R69 2M Ohm	852-312205-001	Update schematic
C16 220pf	C16 470pf	947-045008-471	Update schematic
Not applicable	Insulated white wire jumper from the top of R66 to bottom of the old R65 location.	987-040751-999	Update schematic by shorting R64 to pin 6 of U30.
Not applicable	CR20 and CR21- Add two 1N4748A diodes at P37 Pins 1 and 2.	919-041255-002	Solder two 22 volt 1 watt 5% zener diodes to the traces coming from Pins 1 and 2 of P37 and join cathodes together.
EPROM U23 Old version	EPROM U23 Version 3.2	991-045307-910	Return old EPROM version to Moog for recycling. Be sure to return it in black black velostat foam provided.
K1 .5 amp closure rating	K1 1 amp closure rating	921-045141-002	Replace old relay with one of larger current rating.

DIGITAL BOARD WIRING			
S71 (7 PIN Connector)		Digital Board	
Pin 1 (brown)	On trace running from U12 pin 14 to U11 pin 14.		
Pin 2 (yellow)	Top side of C8 the .01uf		
Pin 3 (white)	On pin 11 of U13		
Pin 4 (blue)	On trace running from U12 pin 4 to U11 pin 4		
Pin 6 (orange)	On trace running from U12 pin 6 to U11 pin 6		
Pin 7 (green)	Bottom of C8 the .01uf		
TRIGGER-IN JACK BOARD ASSEMBLY			
DESIGNATOR	PART NUMBER	DESCRIPTION	
Not applicable	980-046071-001	Printed circuit board	
P71	910-040299-007	Header CIS 7 pin 0.1 ctrs.	
Not applicable	906-045188-016	16 Pin IC socket	
J2	910-045552-003	Jack 1/4" Phone (RN113B)	
U1	991-043521-001	IC4502B CMOS Hex Buffer	
C1, C2, C4	947-045183-103	Capacitor .01 MFD Ceramic	
C3	947-045008-471	Capacitor 470 PFD Ceramic	
R1, R3, R5	852-312104-001	Resistor 100K 1/4W +/-5%	
R2, R4, R6	852-312474-001	Resistor 470K 1/4W +/-5%	
JACK WIRING			
JACK	FROM		
DIN Pin 1	Blue wire from jack board		
DIN Pin 2	Green wire from jack board		
DIN Pin 3	Brown wire from jack board		
NEW JACKS			
S-trig out (hot)	White/yellow wire shorten to 9" from S37 Pin 6		
S-trig in (hot)	White/violet wire shorten to 9" from S37 Pin 7		
S-trig in (gnd)	Green wire from S15 Pin 7		
S-trig out (gnd)	Bare wire 1.5" long to S-trig In (gnd)		
To tape (hot)	Black wire shorten to 8" from S37 Pin 3		
To tape (gnd)	Shield wire shorten to 8" from S37 Pin 4		
From tape (hot)	White/blue wire shorten to 8" from S37 Pin 5		
From tape (gnd)	Green wire 2" long to tape (gnd)		
Remote (plastic thread) (hot)	White/black/red wire shorten to 8" from S37 Pin 1; add 4.7 ohm resistor, part number 852-512047-001 in series with this wire and cover with heat shrink tubing.		
Remote (plastic thread) (gnd)	White/black/orange wire shorten to 8" from S37 Pin 7.		
	Tie wrap where necessary		
SYNTHESIZER BOARD MODIFICATIONS			
DELETE	ADD	PART NUMBER	COMMENTS
R225 1K Ohm 1%	R225 909 Ohm 1%	853-429090-031	Adjust R223 to 250 Hz maximum and update schematic and test procedures accordingly
R224 1MEG	Deletion only	"As required"	Delete this resistor only if unable to adjust R223 to the 250Hz requirement above.

SOURCE SOFTWARE AND ACCESSORIES  
 Moog Music Inc.  
 2500 Walden Avenue  
 Buffalo, NY 14225

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DESCRIPTION	PART NUMBER	\$ EACH	TOTAL
Cassette of factory programs	935-044665-001	\$10.00	
Cassette of programs by Jan Hammer featuring FEEDBACK, STEEL DRUM, SYNC and many bass programs.	935-044665-002	\$10.00	
Cassette of DEVO programs by Mark Mothersbaugh from his latest album cuta.	935-044665-003	\$10.00	
Cassette of programs by Gary Wright from his ENDANGERED SPECIES, LIGHT OF SMILES, DREAM WEAVER and WRIGHTS PLACE albums.	935-044665-004	\$10.00	
"DIN" CABLE, 12', double ended, for use with rhythm unit interfacing.	957-045453-001	\$15.00	
"DIN" CABLE, 6', terminated with two 1/4" phone plugs for use with rhythm unit interfacing for SYNC and START/STOP.	957-045453-002	\$15.00	
"CV INPUT" cable 10' 1/4" stereo to 1/4" mono (ring to ground connection). NOTE: "CV OUTPUT" can be accomplished with a standard mono guitar cable.	957-046077-901	\$10.00	
TAPE RECORDER cable and other general purpose uses. Molded 1/4" phone to RCA (phono) plug - 6' long.	957-043396-001	\$10.00	
GENERAL INTERFACING cable. 1/4" phone to 1/8" (3.5mm) miniature plug.	957-043396-002	\$10.00	
POWER CORD, detachable 120V U.S.A.	957-041794-001	\$ 8.00	
POWER CORD, detachable 220V EUROPE	957-043400-001	\$ 9.00	
PAINTER'S CAP - White cotton with plastic white bill and 1-1/2" black MOOG logo. Adjustable back strap - one size fits all.	935-044681-001	\$ 5.00	
SOURCE T-SHIRT - 50% cotton/polyester, full cut with set-in sleeves and ribbed neck. Light blue with a screened SOURCE super- imposed on an expanding grid pattern with lettering "MAY THE SOURCE BE WITH YOU".	Small 935-043322-961 Medium 935-043322-962 Large 935-043322-963 X-Large 935-043322-964	\$ 6.00 \$ 6.00 \$ 6.00 \$ 6.00	

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